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**Mori**

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(54) **TUBULAR BURNER**

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3,288,198	A *	11/1966	Hein et al.	431/349
3,570,242	A *	3/1971	Leonardi	F23R 3/04
				431/183
3,850,571	A *	11/1974	Zink et al.	431/349
4,846,716	A *	7/1989	Courrege	431/263
5,049,066	A *	9/1991	Kaiya et al.	431/352
5,186,620	A *	2/1993	Hollingshead	F23D 14/045
				239/558
RE34,541	E *	2/1994	Kreiger	431/1
5,433,602	A *	7/1995	Sigler	431/286

(Continued)

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See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

431,716	A *	7/1890	Canfield	431/354
790,714	A *	5/1905	Bray	239/553.5
1,163,650	A *	12/1915	Fogler	110/264
1,179,781	A *	4/1916	Varnum	431/330
1,354,295	A *	9/1920	Hamilton	239/432
1,908,135	A *	5/1933	Forster	239/432
2,365,945	A *	12/1944	Ferguson	239/425.5
2,901,032	A *	8/1959	Brola	431/264
2,929,442	A *	3/1960	Brola	431/262
3,074,469	A *	1/1963	Babbitt et al.	431/285
3,156,292	A *	11/1964	Ross	239/419.5
3,198,238	A *	8/1965	Hughes	431/349

**FOREIGN PATENT DOCUMENTS**

JP	57-127122	U	8/1982
JP	62-106212	A	5/1987

**OTHER PUBLICATIONS**

Office Action from Japanese Patent App. No. 2010-176153 (Feb. 18, 2014).

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(57) **ABSTRACT**

A tubular burner includes a mixing tube and a flame hole member having a plurality of flame holes. The flame hole member is made of a sheet metal plate and has: a circular disk part having the plurality of flame holes formed therein; and a fitting tubular member which is elongated backward from a periphery of the circular disk part and is adapted to be fitted into an inner circumference at the front end region of the mixing tube. A clearance-generating section is formed at a front of the fitting tubular member so as to generate an annular clearance between the clearance-generating section and the inner circumference at the front end region of the mixing tube. A plurality of flame retention holes are formed in the clearance-generating section at a circumferential distance from one another.

**5 Claims, 4 Drawing Sheets**

